

**Understanding the retail
performance of broccoli using
a tool for determining in
store performance and
consumer demand**

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Fresh Change

Project Number: VG05100

VG05100

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VG 05100**

Stage 1 Benchmarking Report

May 2009

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Key Findings of Benchmarking Report

Findings:

Scan data from four retail grocery stores was collected over a four week period. Stores 1 and 2 were larger 'supermarket' style stores, with Stores 3 and 4 being smaller, convenience-style, grocery stores with extended shopping hours. The following details the key findings of the analyses.

- Strong product loyalty is evident in all stores
 - In Stores 1 and 2 it would seem that there is a core group of customers who will purchase broccoli regardless of price, and another group who will enter the market when price drops to a certain level. The percent of customers purchasing broccoli in Stores 1 and 2 more than doubled when the price dropped to a low of \$2/kg.
 - In Stores 3 and 4 customers are price insensitive and will purchase broccoli regardless of price. Customers in Store 4 were generally price insensitive up to \$6/kg and as price increased from \$3.50/kg, quantity sold also increased.
 - Whilst the customers from Stores 1 and 2 tend to be more price sensitive, by proportion, a higher percentage of these customers purchase broccoli than customers in Stores 3 and 4.
- There exists potential to increase sales by retaining the customers who 'entered the market' when the price dropped to \$2/kg. The challenge is to increase these customers' price tolerance and product loyalty, by possibly promoting the health benefits of broccoli and improving its 'value proposition' so that as prices return to a higher and more sustainable level (dependent on location and cost price), these customers can be retained.
- The day of the week ie. Sunday, Monday or Tuesday appears to be a greater determinant of daily quantity sold than price (in Stores 3 and 4).

Observations:

- Customer's sensitivity to price changes is more evident in the suburbs with lowest weekly household income.
- Customers from Stores 1 and 2 are the most price sensitive, but were also exposed to the greatest variations in price. Prices in Store 1 ranged from a high of \$9.50/kg to a low of \$2.00/kg during the benchmarking period.
- In contrast, the price per kilogram in Stores 3 and 4 did not exceed \$7.00/kg and did not drop lower than \$3.50/kg.
- Stores 1 and 2 had the highest percent of customers purchasing fresh products and broccoli in their baskets.
- Substituting product analysis was only undertaken in Stores 1 and 2, because these stores had the greatest marked change in price, and were most price sensitive. Some degree of substitution is apparent. When the price of broccoli dropped to its

lowest, and sales conversely reached their highest, it would appear that sales of both broccolini and asparagus suffered to some extent

- As price dropped to \$2/kg in both Store 1 and 2, the percent of customers who purchased broccoli increased significantly. In Store 1, the percent of customers purchasing broccoli more than doubled from around 3.5% to 8%, whilst in Store 2 it more than tripled (from around 2% to between 4½ and 7½%).

Assessment of Demographic Data (2006 ABS Census Data)

The demographic profile of the suburbs in which the stores are located was examined to gain a better understanding of the profile of customers in each of the four stores. This information has helped explain the variations in consumer behaviour evident across the stores.

- Customers of Store 1 have, on average, the lowest weekly household income of all the stores at 17% lower than the Australian average.
- Customers of Store 2 are typically families with children. 80% households in this suburb are family households', with nearly one third of population being children aged between 0 and 14 years. Family weekly income was 2 ½ percent lower than the national average.
- Customers of Store 3 are the most affluent, with weekly family income 53% higher than the Australian average.
- Customers of Store 4 are the oldest with 35% of persons aged 55 years and over. The median age of persons in this suburb is 9 years higher (at 46 years) than the national average of 37 years for persons in Australia. The median weekly family income was 7% higher than the Australian average.

Project Objectives

The primary objective of this project is to provide the information tools required to optimise supply chain and in-store performance by:

- Achieving best practice in product handling and rotation.
- Enhancing product quality.
- Increasing the appeal of the retail display.
- Better understanding consumer behaviour.

The secondary objective is to quantify and demonstrate the value gained from relationships between retailer, supplier and grower that are based on pursuit of common goals and objective performance assessment.

Introduction

Horticulture Australia assists the Australian horticultural industry to achieve profitability and growth through a variety of R&D, industry development and marketing programmes. Fresh Change has developed a range of techniques for measuring consumer preference and in-store practices in the retail environment. These technologies enable growers, suppliers and retailers of perishable foods to better match the total product offer with consumer demand. Fresh Change's technologies can also be used to measure supply chain and retail performance enabling a systematic and transparent approach to product and service quality throughout the supply chain – including the retail display and merchandising.

This report details the findings of the benchmarking stage. The results from the benchmarking stage have provided an initial understanding of consumer behaviour patterns and will be used as the basis to undertake a number of interventions to the product offer at point-of-sale in Stage 2. Using the data from Stage 1, comparisons as to the success or otherwise of these interventions on consumer response and sales, will be quantified and measured.

Selection of Stores

Four Queensland-based independent grocery retailers were chosen for the project. Prior to selecting stores in Queensland, wholesale market data for the Brisbane, Sydney and Melbourne markets was analysed to satisfy the project team that there were no significant differences between prices between markets. This was proven to be the case.

Initially, the project plan was to collect store scan data from a number of independent fresh fruit and vegetable retailers as well as two independent grocery retailers. Due to difficulties experienced in accessing data from independent fresh retailers however, the project was expanded to eventually include four independent grocery retailers.

The application developed by Fresh Change to 'decode' scan data from Retech POS systems, had been tested and proven to work. What was not anticipated was the difficulty in locating fresh fruit and vegetable retailers with compatible POS systems. A number of retailers in the Brisbane area were chosen and approached, and whilst the majority were willing and keen to participate in the project, in all cases their POS systems were either not suitably advanced eg. cash registers to allow for electronic download of their transaction data or access to their systems was controlled by third party POS software suppliers or the software to decode the data was not readily available. After exhausting a large amount of

time and resources trying to access the data from the smaller retailers, it was decided that it was more time prudent to approach another two independent grocery retailers who had known Retech POS systems.

The two initial stores, Stores 1 and 2 were larger 'supermarket' style stores and Stores 3 and 4 smaller, convenience-style, grocery stores with extended shopping hours (6am till midnight).

Agreement was reached with the store's owner to access the store scan data and collection of store scan data for all stores, commenced the week starting 3 November, 2008. Daily data was collected in each of these stores over the next four weeks, ending on 30 November, 2008.

Data Integrity

The data for the benchmark period was collected for 4 weeks. Whilst this allows a 'snapshot' to be taken, it is not a long enough time frame to draw strong, statistically valid, conclusions regarding the data. In particular, whilst the price elasticity and demand curve graphs depict certain trends, it is important to recognise that they reflect very large changes in price, which may not necessarily be typical of a 'normal' four week cycle.

Due to data back-up failures at two of the stores, a small amount of data is missing in these store's data. The missing data is represented by a 'dashed' or broken line in the graphs.

In-Store Surveys

In two of the four stores, in-store surveys were conducted on a weekly basis over the benchmark period. These surveys assessed product quality as well as other attributes such as size of display, location of display, signage, proximity to other products, overall presentation and full of display.

Product was assessed across a five point scale for yellowing, firmness (turgidity) and blemishes and rots. Measurements of stem length, size of heads and stem thickness were also taken.

Whilst conducting the in-store assessment, interactions of the customers with the display were also noted.

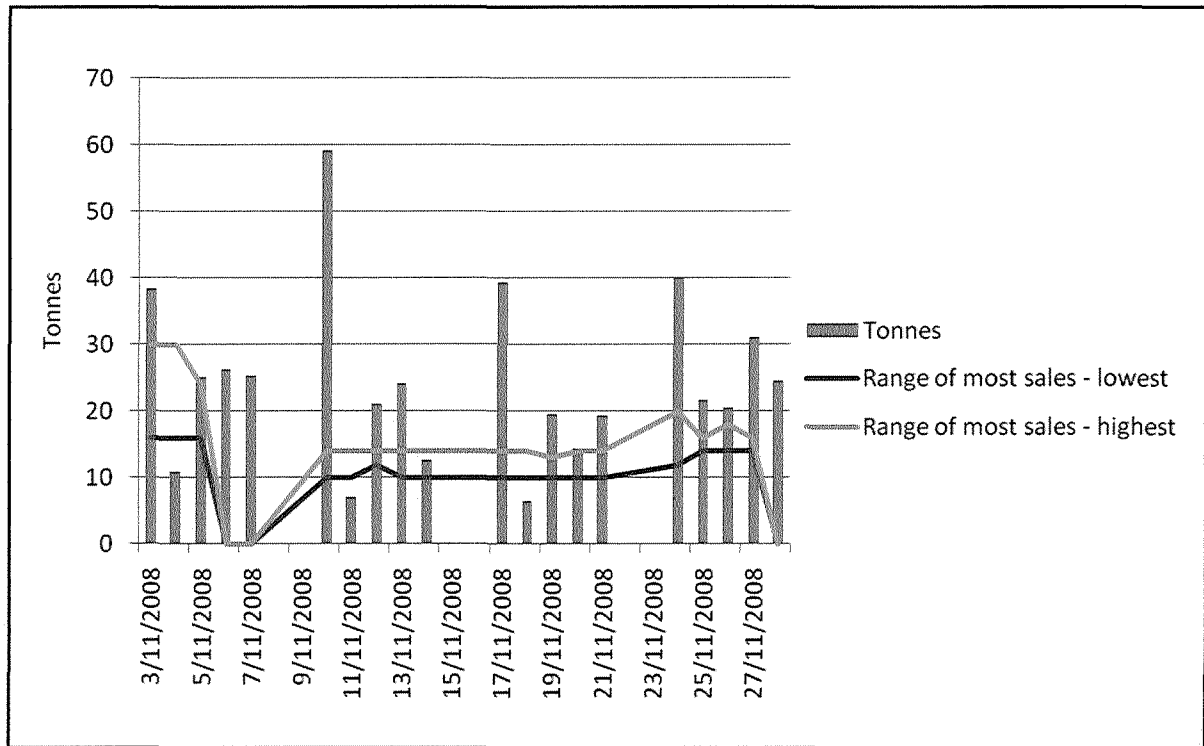
The information collected from the in-store surveys will be used as a basis from which to make a number of interventions in Stage 2.

Wholesale Market Data

Wholesale market data from the Brisbane markets was also analysed for the benchmarking period. Figure 1 shows the volume and price range of most sales (of 8kg packs), from lowest to highest, for product of either Queensland or Victorian origin.

The data in the graph to some extent reflects the store price data in so far that prices were higher at the beginning of the month, but does not account for the significant drop in price evidenced in Stores 1 and 2, around the 21st and 23rd of the month.

Figure 1: Volume and Price range (per 8kg/pk) for Broccoli – Brisbane Wholesale Market – November 2008



Individual store results

Store 1

Store Location and Demographic Profile

Store 1 is located in the least affluent of all the four suburbs in the survey and 2006 ABS data would indicate that in this suburb just over half (55%) of households are 'family households.' The median weekly family income was 17% lower than the Australian average.

The median age of persons in the suburb was 31 years, compared with 37 years for persons in Australia.

Product Quality

The in-store quality and display assessment program was not conducted in this store.

Sales Analysis

During the benchmarking period, the total value of fresh sales ranged from \$83,900 to \$85,100 (with the exception of week 2, where only 1 day's data was available). Broccoli sales accounted, on average over the 4 week period for approximately 2% of total fresh sales, with the weekly sales percentages varying from 2.44% in Week 1 to 1.32% in Week 4. The value of total fresh sales in these weeks did not change significantly, with the drop in percent of sales being due to a 50% drop in broccoli sales. Forty-four percent of all customers purchased 'fresh' products in their baskets, with 4.4% of all customers also purchasing broccoli.

Figure 2: Weekly Total Fresh and Broccoli Sales

	% of Customers buying fresh:		44.47%	
	% of customers buying Broccoli:		4.39%	
	Total Fresh Sales	Broccoli Sales	%	
Week 1	\$ 84,509.57	\$ 2,058.74	2.44%	
Week 2	\$ 13,058.47	\$ 255.79	1.96%	
Week 3	\$ 85,077.06	\$ 1,775.99	2.09%	
Week 4	\$ 83,947.84	\$ 1,106.88	1.32%	
Total	\$ 266,592.94	\$ 5,197.40	1.95%	

Week 2 data is incomplete - only one day's data available

During the 4 week benchmark period, the price per kilogram of broccoli ranged from a high of \$9.50/kg in early November to a low of \$2/kg in the third week. Whilst this dramatic drop in price did significantly increase quantity sold (Figure 4) particularly after dropping \$3/kg between the 19th and 21st of November, total daily sales were only slightly lower than at \$8/kg (Figure 3). As price increased from \$2/kg to \$5/kg however, daily sales (and quantity sold) did not increase, but total sales and quantity sold was lower than when the price was \$8/kg or higher.

Figure 5 shows that as price dropped to \$2/kg, the percent of customers who purchased broccoli more than doubled from around 3.5% to 8%.

Figure 7 graphs the price elasticity of demand for Store 1. The 'Price Elasticity of Demand' ($e_{Q,P}$) measures the percentage change in the quantity demanded of a good in response to a 1 percent change in price. Since it is normally given that price and quantity move in opposite directions $e_{Q,P}$ will normally be negative. The degree of elasticity is measured by determining if $e_{Q,P}$ is less than -1 (elastic), equal to -1 (unit elastic) or greater than -1 (inelastic).

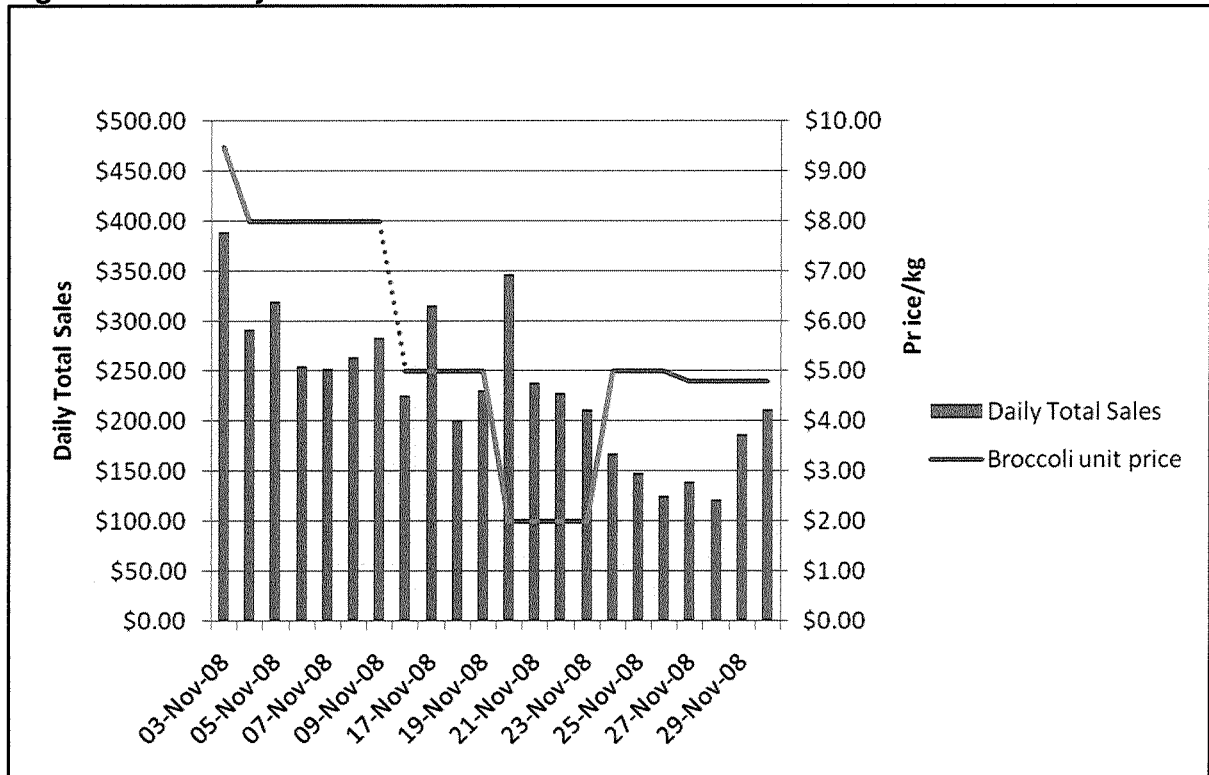
A value of -0.05 for Store 1, indicates that customer's demand for broccoli is related to price. The graph shows that customers tend to be more price sensitive at lower price levels and that demand appears to remain relatively constant between \$5 and \$9 per kilogram.

It would seem that there are two types of customers – those who will always purchase broccoli regardless of price, and those who will enter the market when price drops to a certain level.

A previous study on Broccolini (*Understanding the retail performance of broccolini using a tool in store performance and consumer demand – VG 03100*) found that 30% of consumers who purchased broccolini also purchased broccoli in the same transaction and that about 25% of consumers who purchased asparagus also purchased broccolini at the same time. Given these findings, sales of broccolini and asparagus have also been analysed to determine if there is evidence of product substitution.

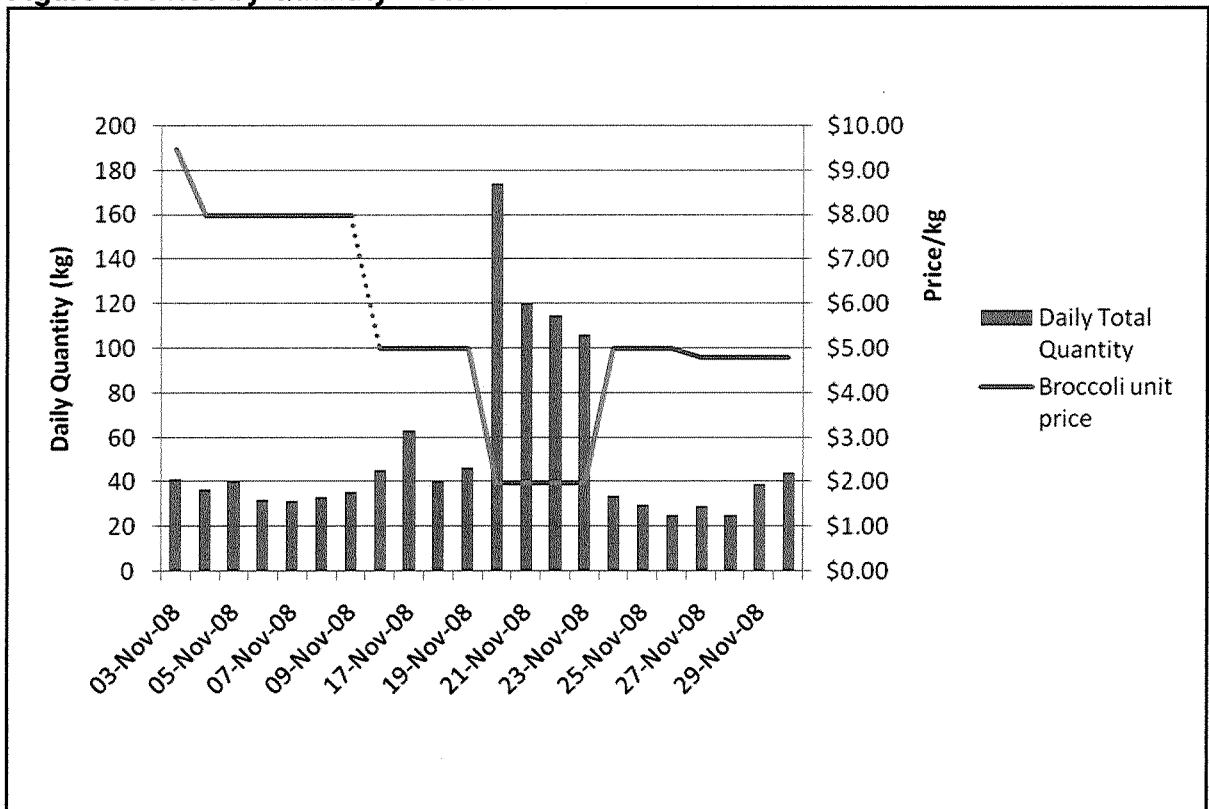
As the total sales of both broccolini and asparagus were relatively low in comparison to broccoli (Figure 6), it is difficult to determine conclusively the extent of substitution effects. It would appear that when the price of broccoli dropped to its lowest, sales of both broccolini and asparagus suffered to some extent. This would seem to indicate that there may be a degree of product substitution away from broccolini and asparagus towards broccoli.

Figure 3 – Price by Sales – Store 1



* The dotted lines represent missing data from week 2.

Figure 4: Price by Quantity – Store 1



1
Figure 5: Percent of customers who purchase broccoli – Store

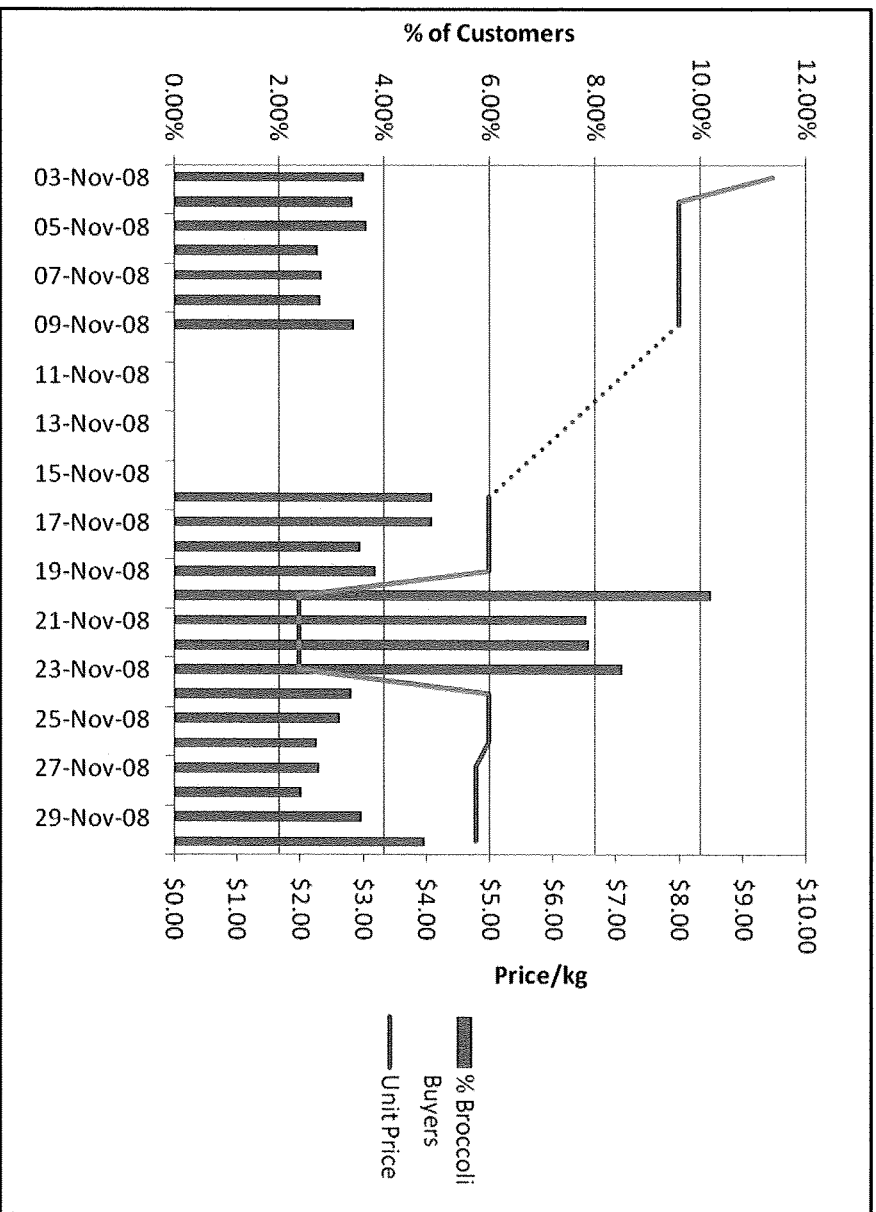


Figure 6: Competing Products – Asparagus and Broccolini – Store 1

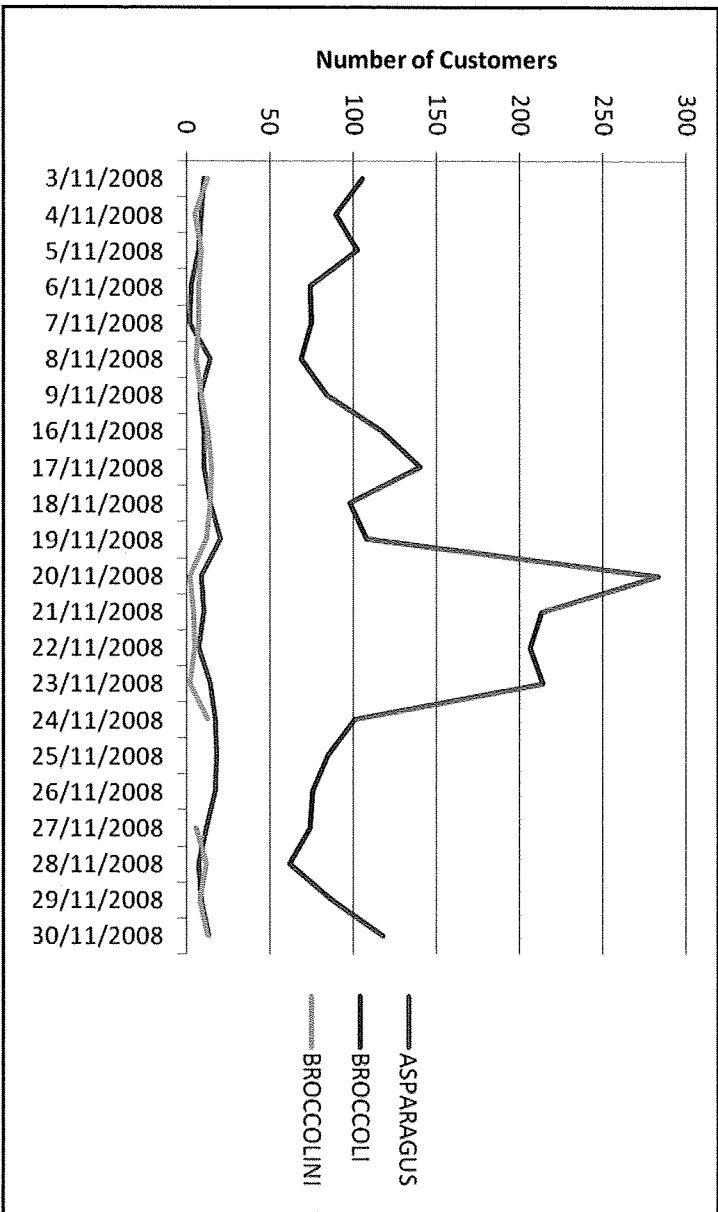
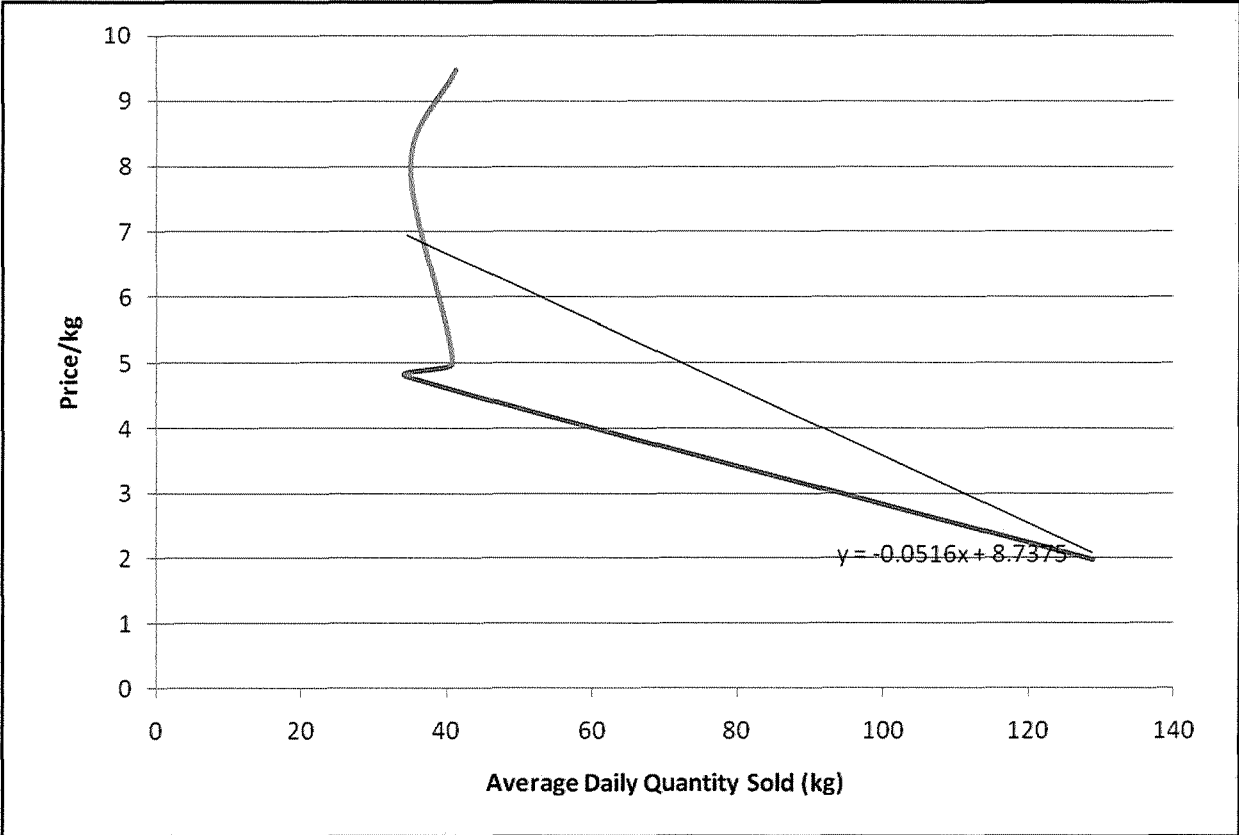


Figure 7: Price Elasticity of Demand – Store 1



Store 2

Store Location and Demographic Profile

Customers in Store 2 are mainly from 'family households' (80%), and have a weekly family income 2 ½ percent lower than the national average.

In 2006, the median age of persons in the suburb was 31 years, compared with 37 years for persons in Australia. Nearly one third of the population were children aged between 0-14 years.

Product Quality

The in-store quality and display assessment program was not conducted in this store.

Sales Analysis

During the benchmarking period, the total value of fresh sales ranged from \$55,760 to \$57,220 per week. Thirty-two percent of all customers purchased 'fresh' products in their baskets, with 2½ percent of all customers purchasing broccoli. With the exception of week 4, broccoli sales accounted for around 2% of total fresh sales.

Figure 8: Weekly Total Fresh and Broccoli Sales

	% of Customers buying fresh:	32.43%		
	% of customers buying Broccoli:	2.53%		
	Total Fresh Sales		Broccoli Sales	%
Week 1	\$ 55,761.63		\$ 1,261.49	2.26%
Week 2	\$ 56,024.14		\$ 1,007.02	1.80%
Week 3	\$ 55,791.40		\$ 1,158.46	2.08%
Week 4	\$ 57,219.17		\$ 683.76	1.19%
Total	\$ 224,796.34		\$ 4,110.73	1.83%

During the benchmarking period, the price per kilogram of broccoli ranged from a just over \$8.00/kg in early November to a low of \$2/kg in the third week. Similarly to the Store 1, a significant drop in price increased demand and total sales.

Figure 13 shows that the price elasticity of demand for Store 2 is -0.07. This is similar to Store 1 and means that customers are sensitive to changes in price and have adjusted their purchase patterns accordingly in most cases. The exception however was around the price points between \$7 and \$4/kg when this seemingly did not occur. This possibly can be accounted for, to some extent, by the drop in demand after price rose back to \$5/kg (24/11) after a low of \$2/kg (20/11 – 23/11). As mentioned previously, quantity demanded at \$5/kg did not return immediately to that prior to the price drop.

As price dropped to \$2/kg the percent of customers purchasing broccoli more than tripled from around 2% to between 4½ and 7½%.

Although, the price elasticity of demand has been statistically shown to be elastic, it could also be argued that if the data from the 20/11 to the 23/11 was removed, the price elasticity of demand would be inelastic ie. regardless of price, quantity demanded remained relatively constant.

As only very small quantities of asparagus were sold on an irregular basis and no broccolini was sold at all, a competing product analysis is not valid.

Figure 9– Price by Sales – Store 2

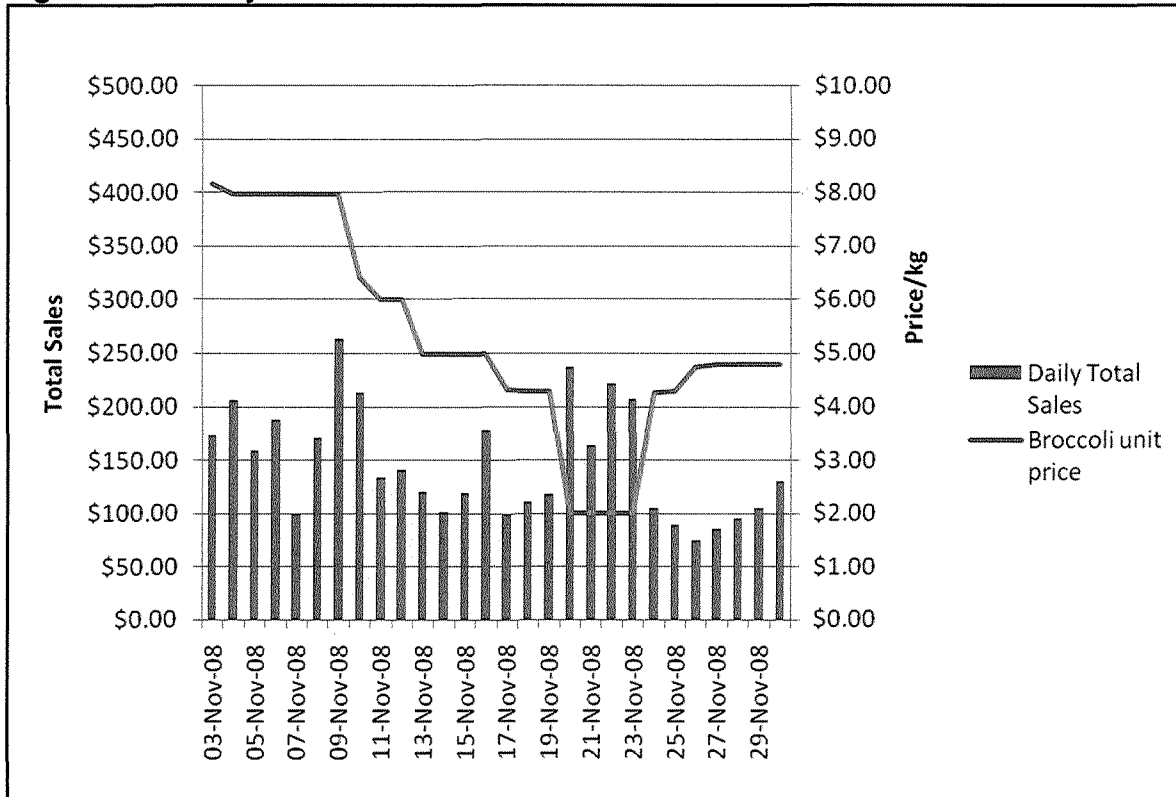


Figure 10: Price by Quantity – Store 2

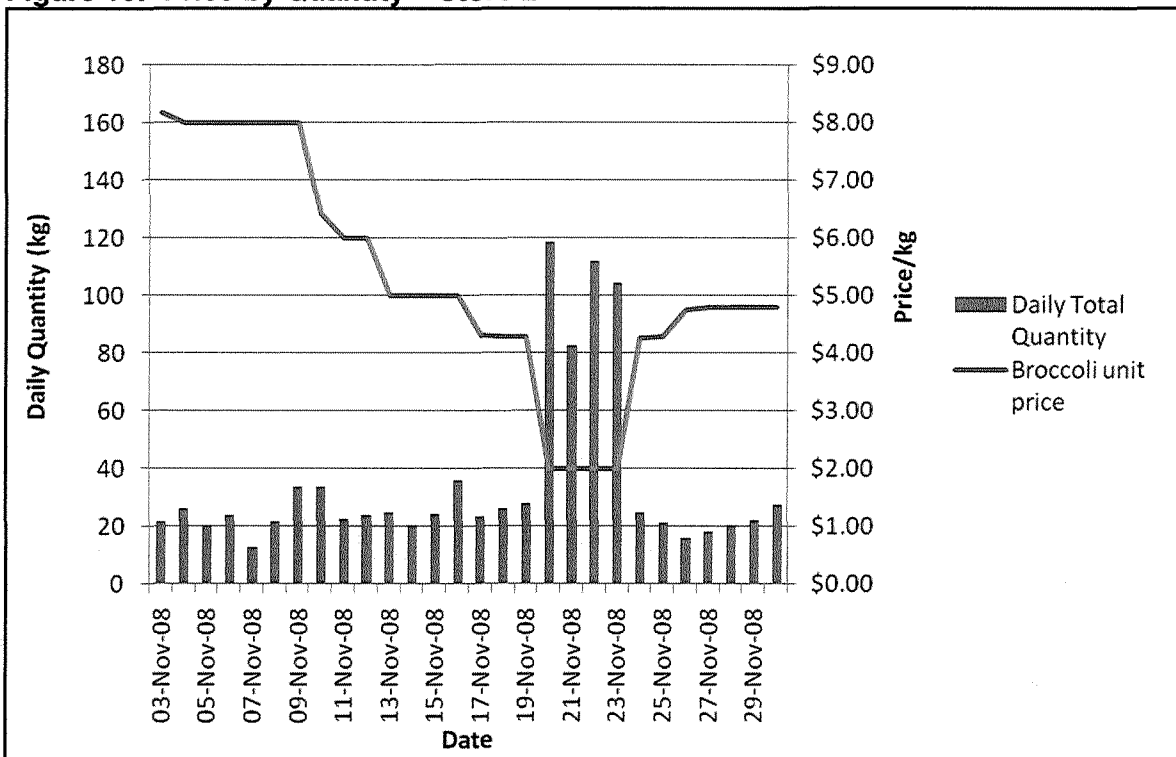


Figure 11: Percent of customers who bought broccoli by Price – Store 2

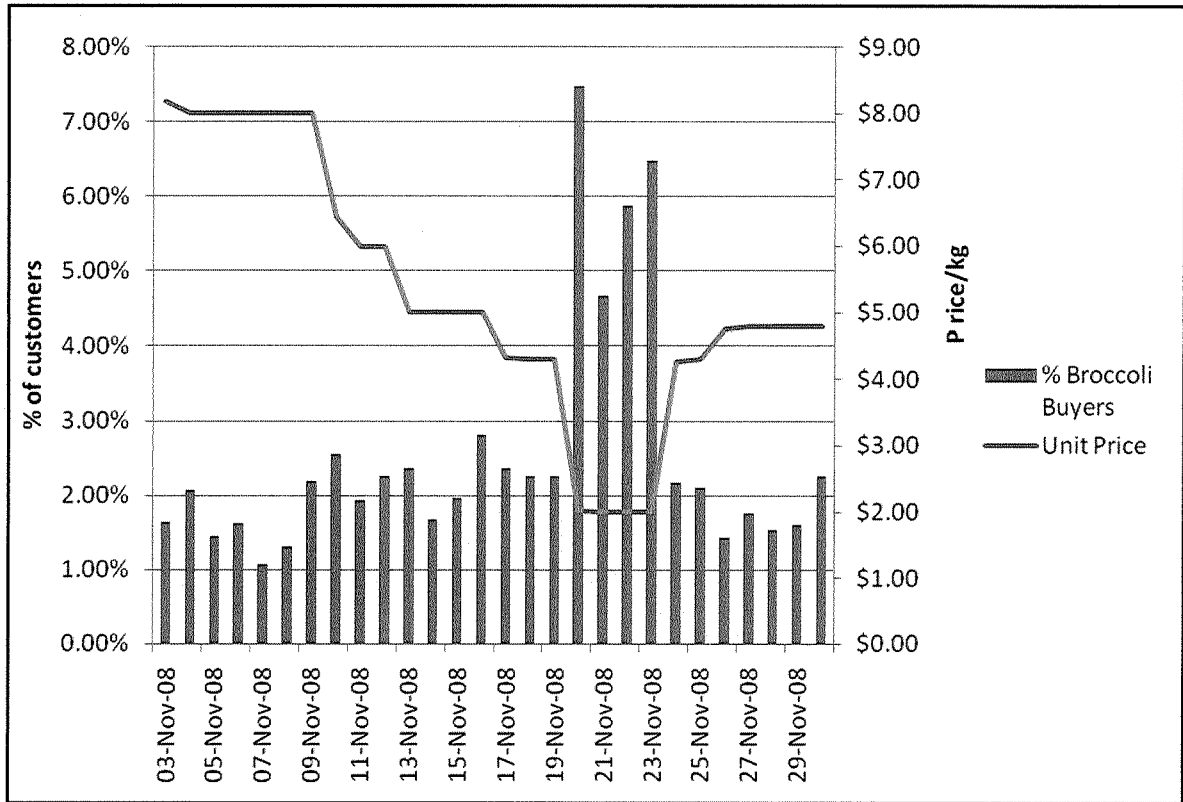
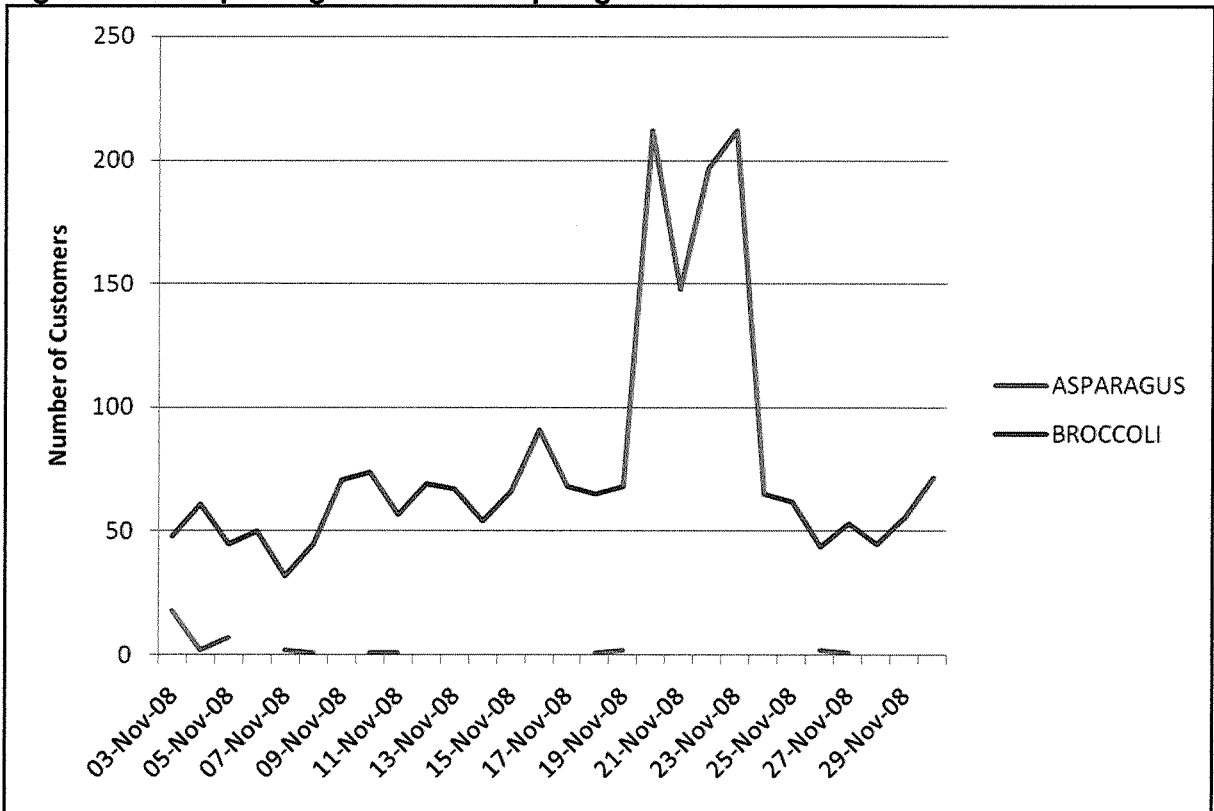
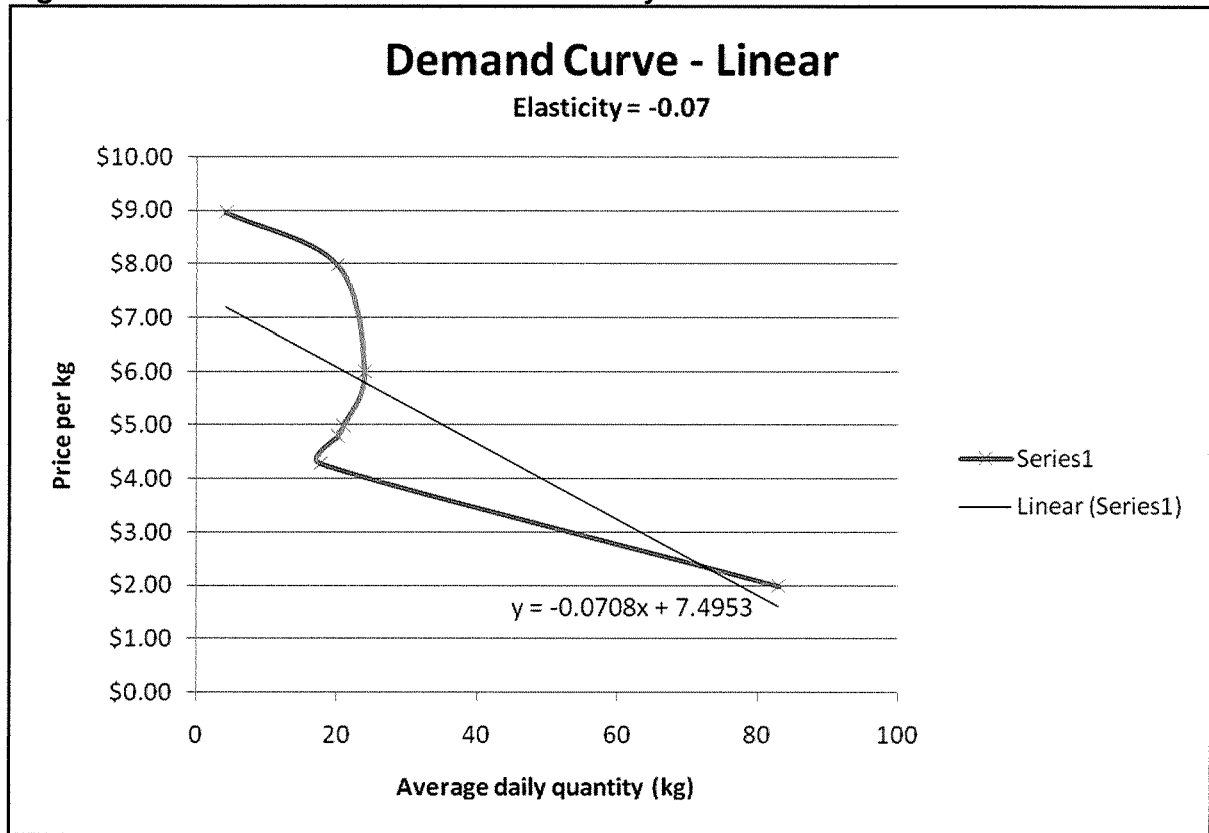


Figure 12: Competing Products – Asparagus – Store 2



*No Broccolini was sold during November

Figure 13 – Demand Curve and Price Elasticity – Store 2



Store 3

Store Location and Demographic Profile

Although less than half (44%) of households in this suburb in which Store 3 is located are 'family households', their weekly family income of \$1,795 per week is 53% higher than in Australia. This suburb has the highest median weekly income of all four suburbs.

The median age of persons in this suburb was 37 years, the same for persons in Australia.

Product Quality

The in-store quality and display assessment program was conducted in this store. During this assessment, customers were observed breaking off leaves and turning over a head of broccoli to look at the stem, rejecting it and choosing a different head.

Generally product quality was good, with displays either full or being re-filled during the assessment. The only exception to this was noted on the 14/11, when the display only contained 6 heads, 3 of which were rated as 'limp/bendy'. Low sales on the previous day of \$10, the lowest for the month and a large drop from the previous days sales of \$55, are more than likely attributable to a combination of these factors. The display was re-stocked whilst the in-store survey was being conducted.

Sales Analysis

During the benchmarking period, the total value of fresh sales ranged from \$12,550 to \$13,300 per week (with the exception of week 3 in which there was missing data). Twenty-three percent of all customers purchased 'fresh' products in their baskets, with 1 percent of all customers purchasing broccoli. Overall, broccoli sales accounted for just under 2% of all fresh sales.

Figure 14: Weekly Total Fresh and Broccoli Sales

% of Customers buying fresh:	23.04%		
% of customers buying Broccoli:	1.06%		
	Total Fresh Sales	Broccoli Sales	%
Week 1	\$ 12,720.48	\$ 310.19	2.44%
Week 2	\$ 13,298.73	\$ 300.55	2.26%
Week 3	\$ 5,972.98	\$ 74.06	1.24%
Week 4	\$ 12,557.35	\$ 187.53	1.49%
Total	\$ 44,549.54	\$ 872.33	1.96%

Data missing 17 - 20 November

Price per kilogram of broccoli sold in Store 3 ranged from \$4.59 to \$6.99. This variation of \$2.40 is the same as recorded in Store 4, and is much less than the variations seen in Stores 1 & 2.

All of the analyses performed on the data from this store indicate that customers are highly price insensitive and will purchase broccoli regardless of price. The price elasticity figure of 0.33 strongly shows that customer demand for product is inelastic ie. regardless of price, customers will purchase product.

Figure 15: Price by sales – Store 3

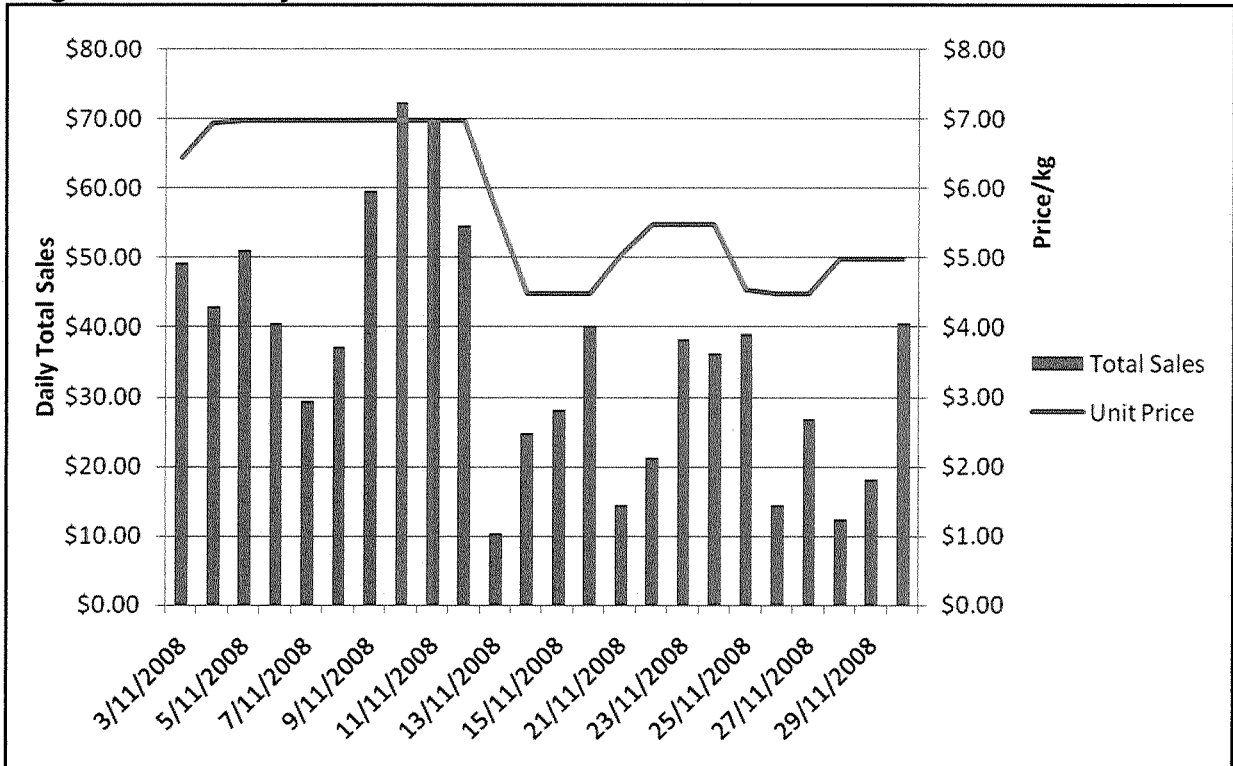


Figure 16: Price by quantity – Store 3

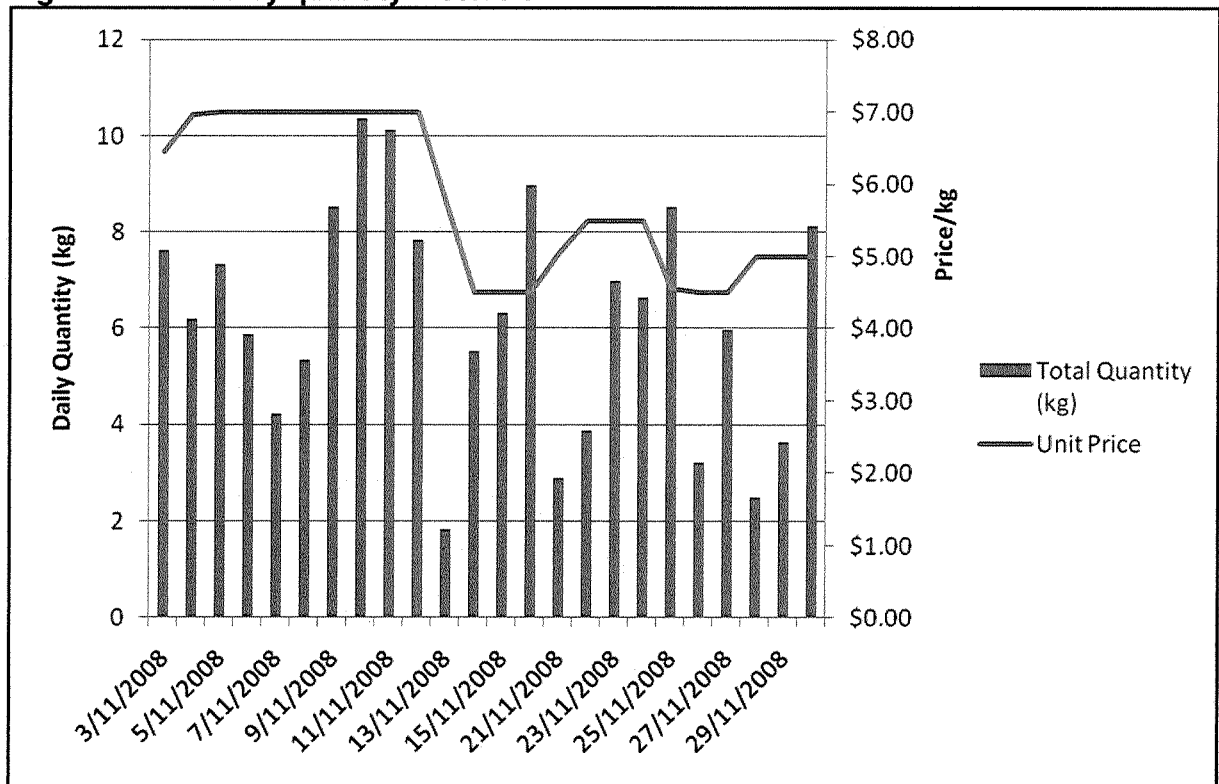


Figure 17: Percent of customers who bought broccoli by Price – Store 3

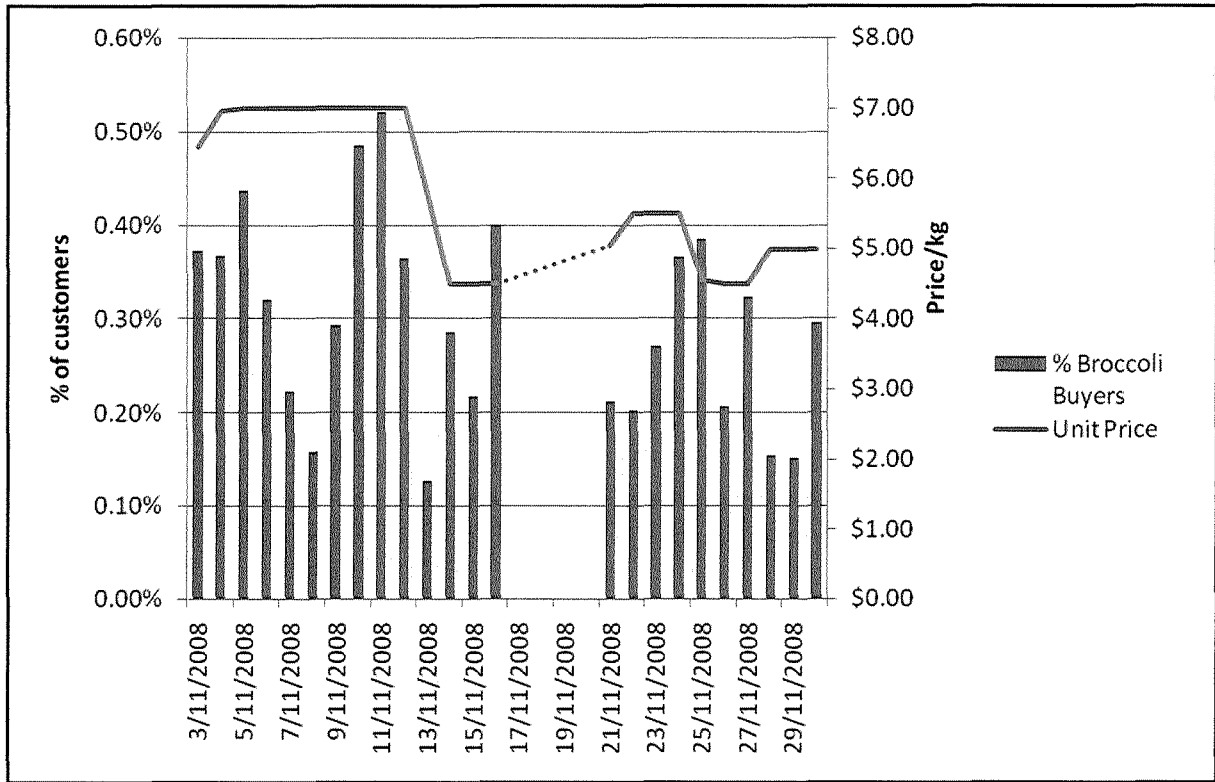
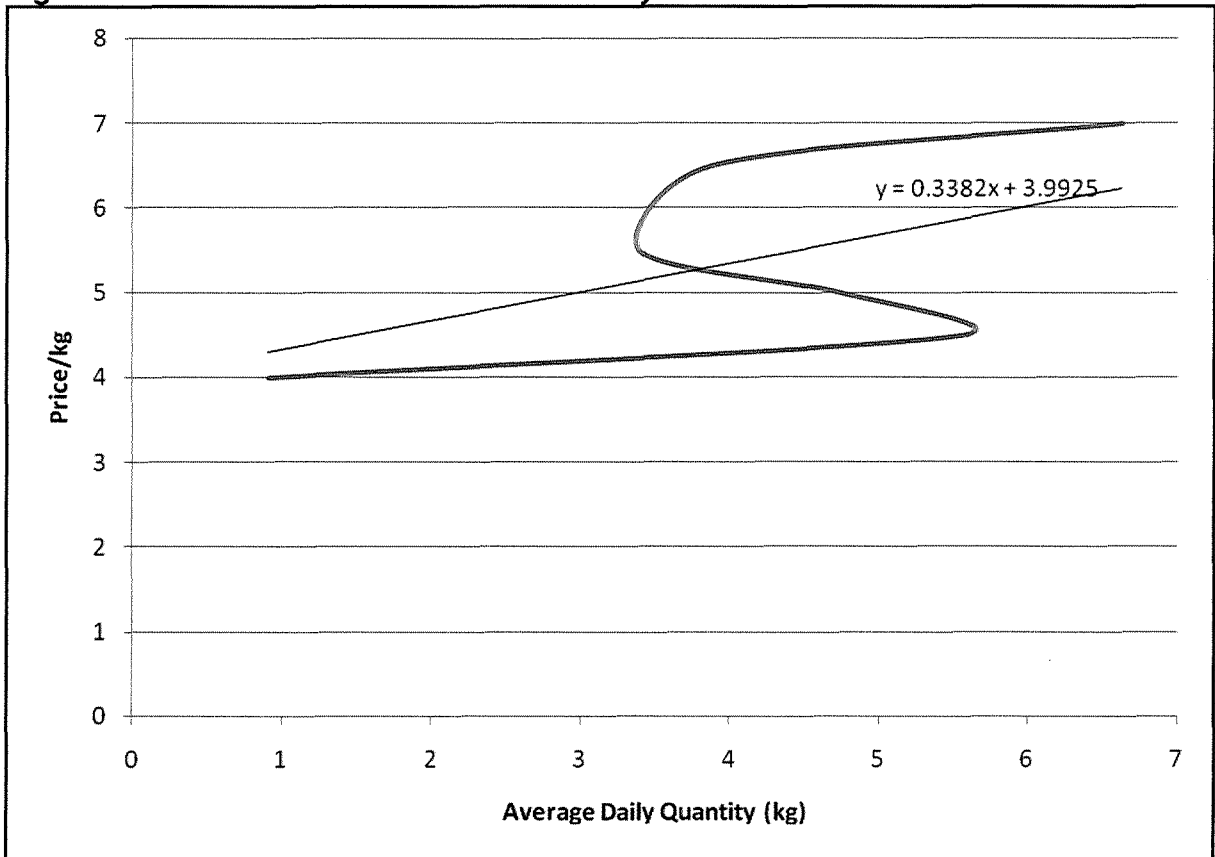


Figure 18 – Demand Curve and Price Elasticity – Store 3



Store 4

Store Location and Demographic Profile

The 2006 ABS data for the suburb in which Store 4 is located, shows that nearly 70% of households in the suburb are 'family households'. The median weekly family income of \$1,251 per week was 7% higher than the Australian average.

The suburb comprises of an older demographic with 35% of persons aged 55 years and over. The median age of persons in this suburb of 46 years is 9 years higher than the national average of 37 years for persons in Australia.

Product Quality

The in-store quality and display assessment program was conducted in this store. Generally product quality was good and displays well filled. The only exception was on the 21/11 and 22/11 when 'limpness of leaves' and 'softness of heads' was noted. Sales on both of these days were significantly lower than sales on the 23/11. Pre-packed 'Reduced to Clear' product was also noted on the 22/11.

Sales Analysis

During the benchmarking period, the total value of fresh sales varied between \$17,700 and \$20,100 per week. The percent of customers buying fresh (23%) and the percent of customers buying broccoli (1%), was nearly identical to Store 3. The percent of broccoli sales to Total Fresh sales was the lowest of all stores at only 1.24%.

Figure 19: Weekly Total Fresh and Broccoli Sales

% of Customers buying fresh:		23.11%	
% of customers buying Broccoli:		1.00%	
	Total Fresh Sales	Broccoli Sales	%
Week 1	\$ 19,693.84	\$ 284.06	1.44%
Week 2	\$ 19,283.98	\$ 251.32	1.30%
Week 3	\$ 20,103.23	\$ 190.84	0.95%
Week 4	\$ 17,693.53	\$ 225.85	1.28%
Total	\$ 76,774.58	\$ 952.07	1.24%

The daily price per kilogram varied from a low of \$3.50 to \$5.99/kg during the month of November. Although price varied within this range, quantity of product sold continued to increase as price increased up to around \$6/kg at which point sales seemed to drop markedly (albeit only on two days). It is more likely that extraneous factors also influenced sales on these few days. The price elasticity of demand score of 0.02 is consistent with this observation.

A very severe thunderstorm warning in the afternoon and product quality issues as noted in the above section, would seem to account for the lowest daily sales of \$3.50 on the 21/11.

Product quality issues were also noted on the 22/11. On the following day (23/11) however, daily sales reached \$58, the third highest for the month.

Figure 20: Price by Sales – Store 4

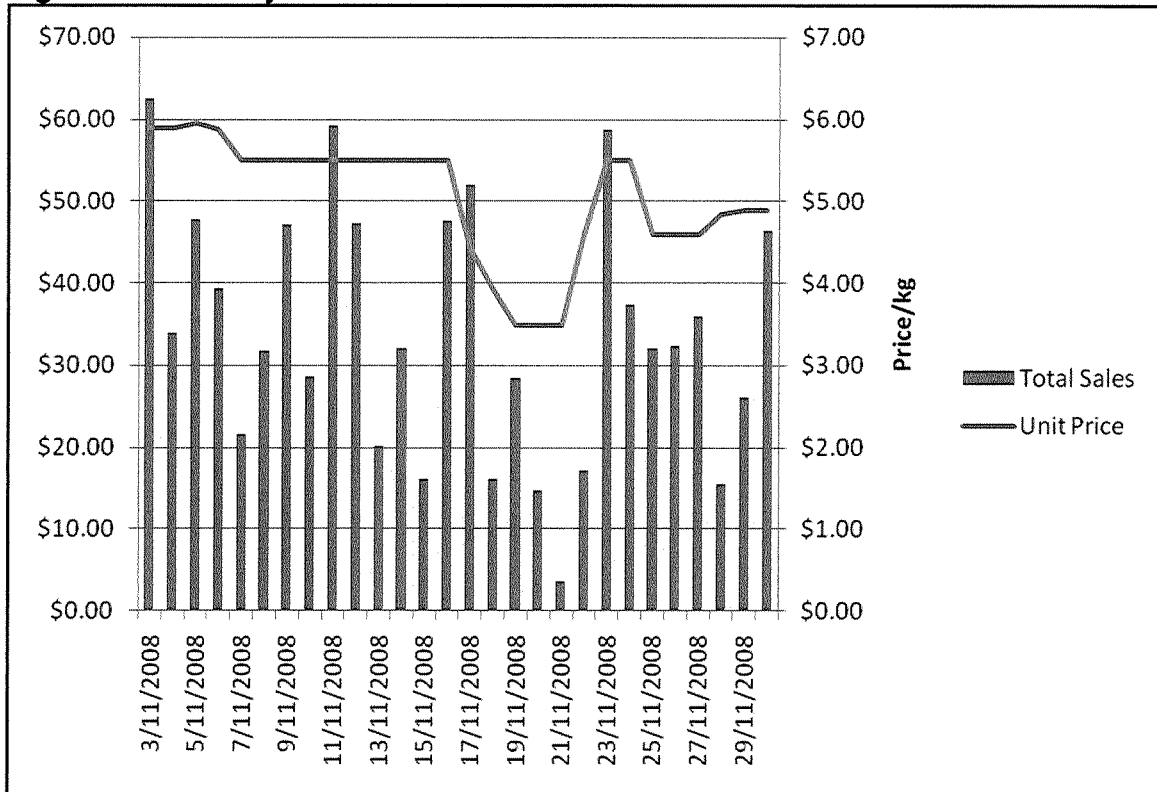


Figure 21: Quantity by Price – Store 4

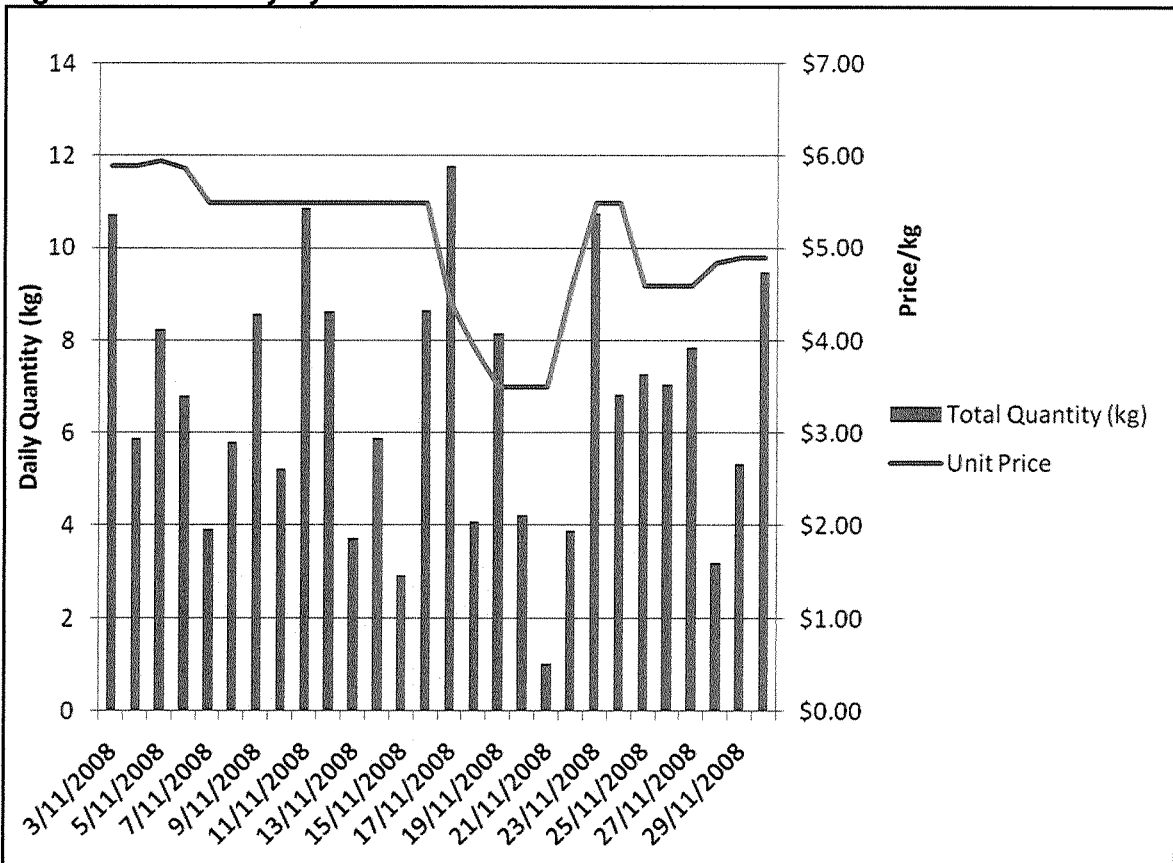


Figure 22: Percent of customers who bought broccoli by Price – Store 4

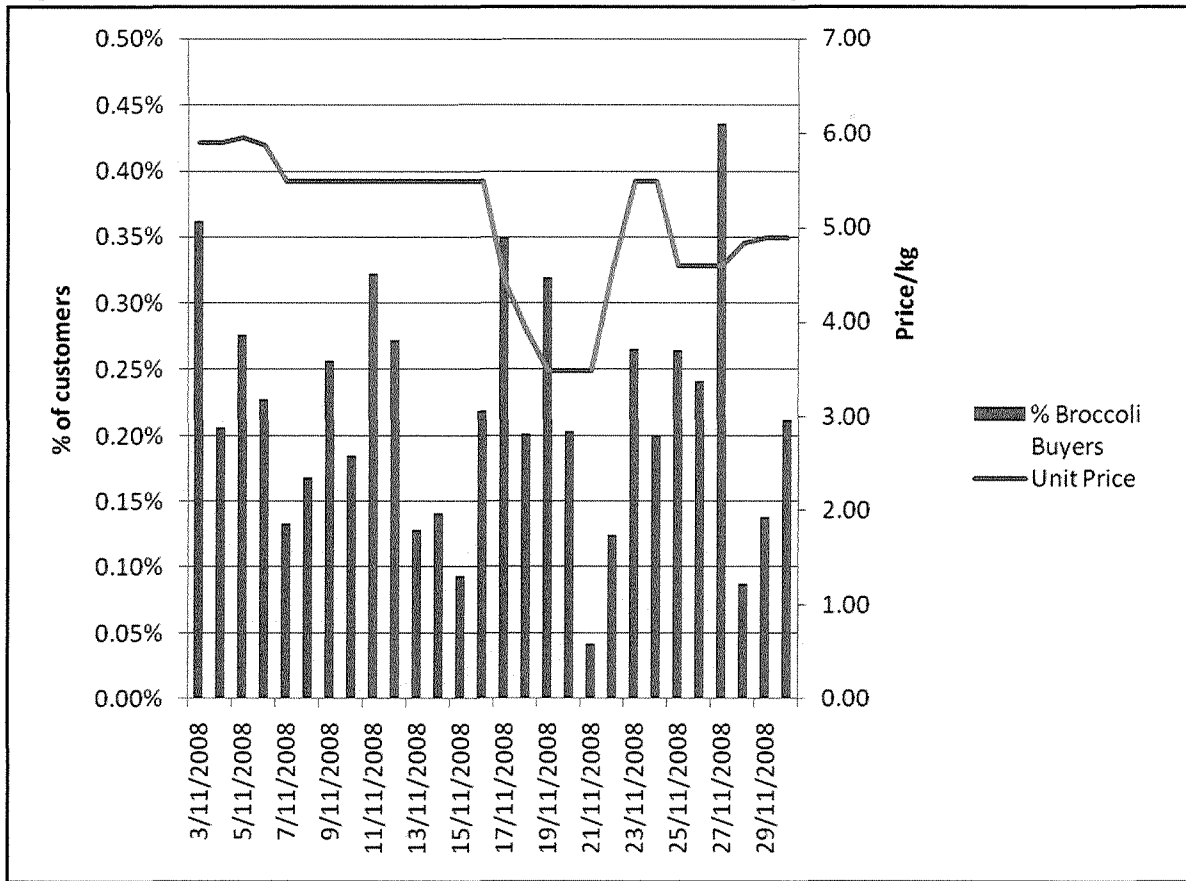
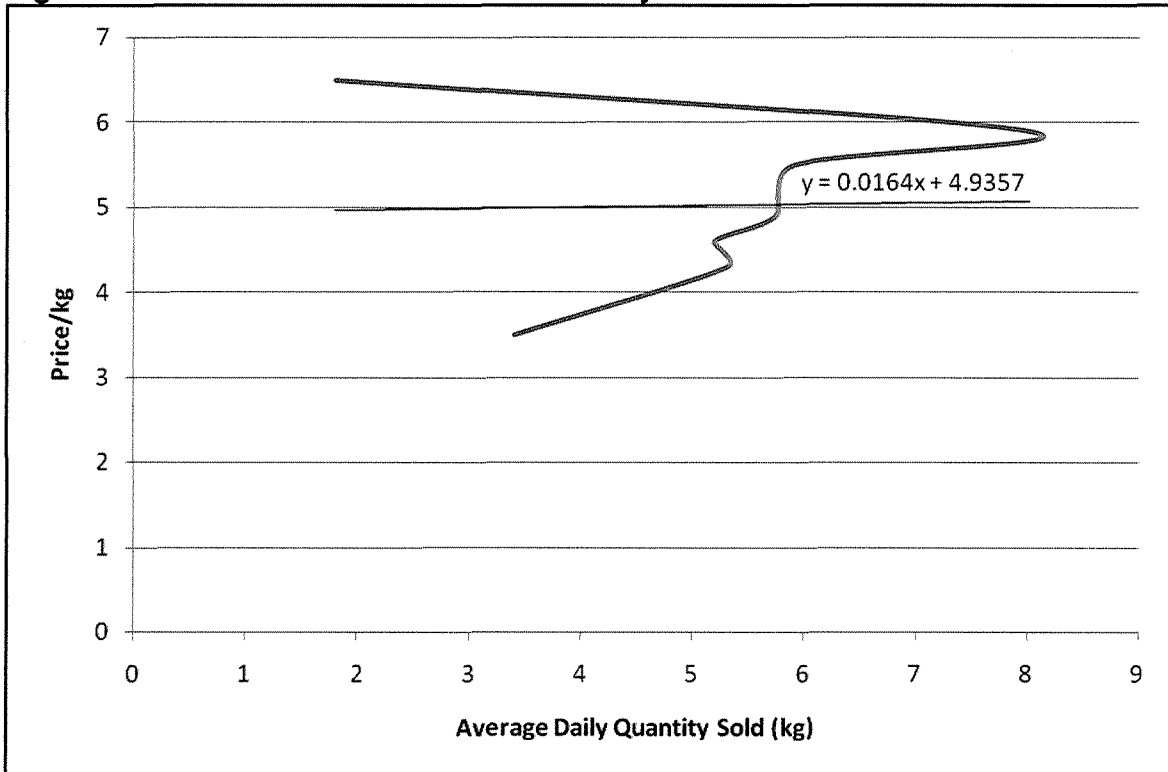


Figure 23 – Demand Curve and Price Elasticity – Store 4



Activities for Stage 2

Given the results of the Benchmark Report, the following activities are proposed for Stage 2.

- With the agreement of the store owners, make a series of interventions at point of sale which may include changing the position and size of the display, promotional information on latest research relating to health benefits, adjustments to price. These interventions will differ between stores, and will be individualised based on the information gathered in Stage 1.
- Subject to data being available, the scan data collection will then be repeated for a 4 week period to assess price changes over a longer time frame. Cost price data will also be collected so that profit calculations can also be included in the Stage 2 analysis.
- In-store product and display assessments will again be conducted to assess customer interaction and product quality and display attributes.
- Conduct a customer survey to determine with product attributes such as stem length, stem thickness and size of heads have an influence on purchase decisions.